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POLICY AND PROCEDURE DIRECTIVE

TO: ALL MANUAL HOLDERS

PPD NO. 02-01

SUBJECT:

EFFECTIVE DATE:

**GUIDELINES FOR INSPECTION AND
ACCEPTANCE OF TIMBER GUARDRAIL
POSTS AND BLOCKS**

August 15, 2002

1. GENERAL

This Policy and Procedure Directive supercedes P.P.D. No. 85-5 of the same title.

The purpose of this directive is to provide guidelines in the inspection and acceptance of timber guardrail posts and blocks, which ensure a product with proper preservation treatment, adequate strength, and good appearance.

Solid timber posts and blocks may be either rough sawn (unsurfaced) or S4S (surfaced four sides) lumber.

Glued laminated timber shall be constructed according to the requirements of ANSI /AITC. The manufacturing plant for glued laminated timber shall be certified and licensed by AITC. The manufacturer of glue laminated timber posts shall brand the tension face of the post in an area which will be above the ground line and below the bottom of the block. Laminated posts shall be installed with the tension face of the post facing the roadway.

2. APPLICABLE DOCUMENTS

- 2.1 ADOT Standard Specifications, Section 1012
- 2.2 American Wood Preservers Association (AWPA)
- 2.3 Western Wood Products Association (WWPA)
- 2.4 AASHTO M 133, and M 168
- 2.5 ASTM D 2559
- 2.6 American National Standards Institute (ANSI)
- 2.7 American Institute of Timber Construction (AITC) 113
- 2.8 ANSI /AITC A 190.1
- 2.9 International Conference of Building Officials, Evaluation Service (ICBO ES)

3. CLASSIFICATION

3.1 Solid Timber Posts and Blocks:

- 3.1.1 Solid timber, rough sawn shall be graded in accordance with WWPA Grading Rules, Section 80.00 for Post and Timbers, No. 1 or better.
- 3.1.2 Solid timber, S4S shall be graded in accordance with WWPA Grading Rules, Section 80.00 for Post and Timbers, No. 1 or better.

3.2 Glue Laminated Timber Posts and Blocks:

- 3.2.1 Lumber used for glue laminated timber guard rail posts and blocks shall conform to WWPA Grading Rules, Section 62.00, Structural Joists and Planks, No. 1 or better S4S lumber.
- 3.2.2 Adhesive used to bond laminated wood products shall be a two-component system that complies with ASTM D 2559 and has passed the ICBO ES, Acceptance Criteria for Exterior Sandwich Panel Adhesives (AC05).
- 3.2.3 Laminated posts and blocks shall be glued together in a face-to-face glue joining, conforming to the requirements of AITC standards.

- 3.3 The required posts and blocks sizes shown in the contract documents shall be understood to be nominal dimensions. Allowable tolerances are shown in Subsection 5.5, Field Inspection.

4. WOOD PRESERVATION TREATMENT & FABRICATION

- 4.1 Drilling or fabrication should be done where possible before preservation treatment process. In event of a mechanical injury or field cutting, field treatment should be in accordance with AWP Standard M2.
- 4.2 The treatment process, including seasoning shall be in accordance with the requirements of AASHTO M 133, and AWP C1, C2, and C28.
- 4.3 The inspection at the wood preservation plant for posts and blocks shall conform to the requirements of AWP M2.

- 4.4 The Materials Central Laboratory or the Regional Materials Laboratory nearest to the treatment plant may conduct the inspections at wood preservation plants or fabrication facilities within the state. For wood preservation plants or fabrication facilities outside the state, an approved consulting inspection service may be engaged.
- 4.5 A quality check on the certification procedure for the treatment of posts and blocks, a spot check type of inspection of the wood preservation plant facilities, will be periodically performed. This will include observing the conditioning process, checking the residual moisture before treatment, checking sampling and testing preservative agents, and checking assay procedures.

5. FIELD INSPECTION

- 5.1 The responsibility for acceptance of the posts and blocks will be that of the Engineer on the Project. Certification by the wood preservation plant will not substitute for the inspection for "Grade of Lumber".
- 5.2 A copy of the certification for preservation treatment and stress grade, together with the treatment assay sheet is to accompany each shipment of posts and blocks.
- 5.3 The contractor shall submit to the Engineer a Certificate of Compliance conforming to the requirements of the ADOT Standard Specifications Subsection 106.05. The certificate shall be furnished by the post and block supplier and shall also include the following information: (a) Identification of the qualified inspection and testing agency, (b) the species or species group of lumber as well as the grade, and (c) identification of the recognized standard to be used as an acceptance basis for this product.
- 5.4 Unloading, handling, and job site storage procedures:
 - 5.4.1 Cable slings or chokers should not be used to handle post and block materials unless adequate blocking is provided between the cable and the wood member. Protection cleats or blocking shall be applied at pick-up points to protect corners. A level storage area is required to avoid warping. Wood members shall be supported with blocking so spaced as to provide uniform and adequate support. Stored wood members shall have the top and all of the sides covered with a moisture resistant covering.

- 5.5 Allowable dimensional tolerances for posts and blocks:
- 5.5.1 Dimensional tolerances for solid timber rough sawn posts and blocks shall be plus or minus 1/16 inch in thickness and width; and plus or minus 1/8 inch in length.
 - 5.5.2 Dimensional tolerances for solid timber (S4S) posts and blocks shall be plus or minus 1/2 inch in thickness and width; and plus or minus 1/8 inch in length.
 - 5.5.3 The standard dimensions for glue laminated posts and blocks (S4S) with a nominal dimension of 6 inches x 8 inches shall be finished to the dimensions of 5-1/2 inches x 7-1/2 inches, according to AITC 113. Dimensional tolerances for glue laminated lumber posts and blocks shall be plus or minus 1/16 inch in thickness and width; and plus or minus 1/8 inch in length.
- 5.6 The following are guidelines for inspection of appearance and physical characteristics for grade. Definitions, characteristics, and the maximum allowable values are listed below for solid timber and glue laminated posts and blocks. See WWPA Section 80.00 for additional information for solid timber posts and blocks. See WWPA Section 62.00 for additional information for lumber used in glue laminated posts and blocks.
- 5.6.1 **Grain** – *The fibers in wood and their direction, size, arrangement, or quality.* A medium grain is required, which means an average of 4 or more annual rings per inch measured on a line perpendicular to the rings. See Figure A and WWPA Section 170.00 for additional information.

Slope of grain is the deviation of the wood fiber from a line parallel to the edges of the piece. A maximum deviation of 1 in 10 is allowable. See Figure B, WWPA Section 230.00, and WWPA Section 712.00 for additional information.
 - 5.6.2 **Sapwood** – *The outer layers of growth between the bark and the heartwood which contain the sap.* For further explanation see WWPA Section 738.00.
 - 5.6.3 **Heartwood** – *The inner core of the tree trunk comprising the annual rings containing nonliving elements.* In some species, heartwood has a prominent color different from the sapwood. For further explanation see WWPA Section 714.00.

- 5.6.4 **Splits** – *A separation of the wood through the piece to the opposite surface or to an adjoining surface due to the tearing apart of the wood cells. A split which extends into the piece on a plane parallel to the bolthole shall not be accepted. See Figure A.*

For solid timber guard rail posts and blocks, the length of a split shall not exceed the width of the piece. Splits equal in length to the width of the piece, or equivalent to the total length of end checks, are permissible. See Figures A and B.

For lumber used for glue laminated posts and blocks, splits equal in length to the width of the piece are permissible. For further explanation see WWPA Section 742.00.

- 5.6.5 **Checks** – *A separation of the wood normally occurring across or through the rings of annual growth and usually as a result of seasoning. Checks are measured as the penetration perpendicular to the widest face. Where two or more checks appear on the same face, only the deepest one is measured. Where two checks are directly opposite each other, the sum of their depths are taken.*

For solid timber posts and blocks, checks are allowed to be a maximum of $1/2$ the thickness of the post or block for single checks, or for checks opposite each other the sum of their depths is allowed to be a maximum of $1/2$ the thickness of the post or block. See Figure A.

Checks in glue laminated timber guard rail posts and blocks may appear as openings parallel to the grain on the sides of the members, (See Figures A, B, and C). Surface seasoning checks are not limited. Checks which are located outside the shear critical zone (See Figure D) and which run in the direction of the length of the post are permitted to be a maximum of $3/16$ inch in width and have a depth of not greater than $1/3$ of the width of the laminated member. Allowable checks in the shear critical zone are determined by the equations shown in Figure D [$d_{\text{allowable}} = 0.1W$] and [$l_{\text{allowable}} = 0.9W$], but $l_{\text{allowable}}$ shall not be greater than 6 inches]. The length (l) of side checks is not restricted. Through checks at ends are limited as for splits, see Figure A.

- 5.6.5 **Holes** – *Holes may either extend partially or wholly through the piece. An alternate designation for holes, which extend only partially through the piece, is surface pits. Limitations shown below do not include holes drilled for hardware.*

For solid timber guard rail posts and blocks, holes shall be limited to pin hole sizes. A pinhole is defined as not being over 1/16 inch in diameter.

Holes in lumber for glue laminated posts and blocks from any cause shall be limited to a maximum of 1-1/4 inches, and are further limited to one hole of a maximum of 1-1/4 inches, or equivalent smaller holes, for each 3 linear feet. For further explanation see WWPA Section 716.00.

5.6.6 **Skips** – *Skips are areas on a piece that failed to surface clean.*

For solid timber guard rail posts and blocks, occasional skips up to 1/8 inch in depth and two feet in length are allowable.

Hit-and-miss skips in lumber for glue laminated guard rail posts and blocks are allowed in a maximum of 10% of the pieces. Hit-and-miss skips are defined as skips which are a series of skips not over 1/16 of an inch deep with surfaced areas between.

5.6.7 **Wane** – *Bark or lack of wood from any cause, except eased edges, on the edge or corner of a piece of lumber.*

For solid timber guard rail posts and blocks, wane which is 1/4, or equivalent, of any face is allowed.

For lumber used in glue laminated guard rail posts and blocks, the allowable wane is 1/4, or equivalent, of the full length of the thickness face and 1/4, or equivalent, of the full length of the width face, provided that wane does not exceed 1/2 the thickness or 1/3 the width for up to 1/4 the length. For further explanation see WWPA Section 750.00.

5.6.8 **Shake** – *A lengthwise separation of the wood, which occurs between or through the rings of annual growth.*

For solid timber guard rail posts and blocks, shake of up to 1/3 the thickness is allowed, see Figure A.

For lumber used in glue laminated guard rail posts and blocks, through shakes at ends are limited as for splits. Surface shakes up to two feet in length are allowed, see Figures A, B, and C. For further explanation see WWPA Section 740.00.

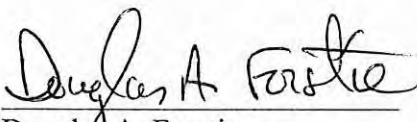
- 5.6.9 **Knots** – *A portion of a branch or limb that has become incorporated in a piece of lumber.* Knots, which are sound and tight, and well spaced, are permitted. A sound knot contains no decay. A tight knot is so fixed by growth, shape or position that it retains its place in the piece.

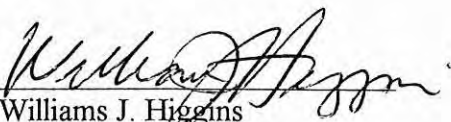
For solid timber guard rail posts and blocks, the knot size limitation on a nominal 6-inch face is 1-7/8 inches, while on an 8-inch face the knot size is limited to 2-1/2 inches. See figure A.

For lumber used in glue laminated guard rail posts and blocks, knots at the edge of the wide face for a nominal width face of 6 inches are limited to 1-1/2 inches. Knots at the centerline of the wide face for a nominal width face of 6 inches are limited to 2-1/4 inches.

5.7 Measurement of Characteristics

- 5.7.1 Grain, checks, holes, skips, wane, knots, and shake may be measured with a tape measure or similar device subdivided to at least 1/16 of an inch. Grain and shake are measured on the ends of the posts and blocks. Checks are most often found on the ends, but may also occur on the sides or faces. Splits and checks are measured for an average depth, or penetration, into the piece. A thin metal spatula or similar blade at least six inches in length may be used for this determination. The blade should be inserted firmly, but not forced into each split or check.


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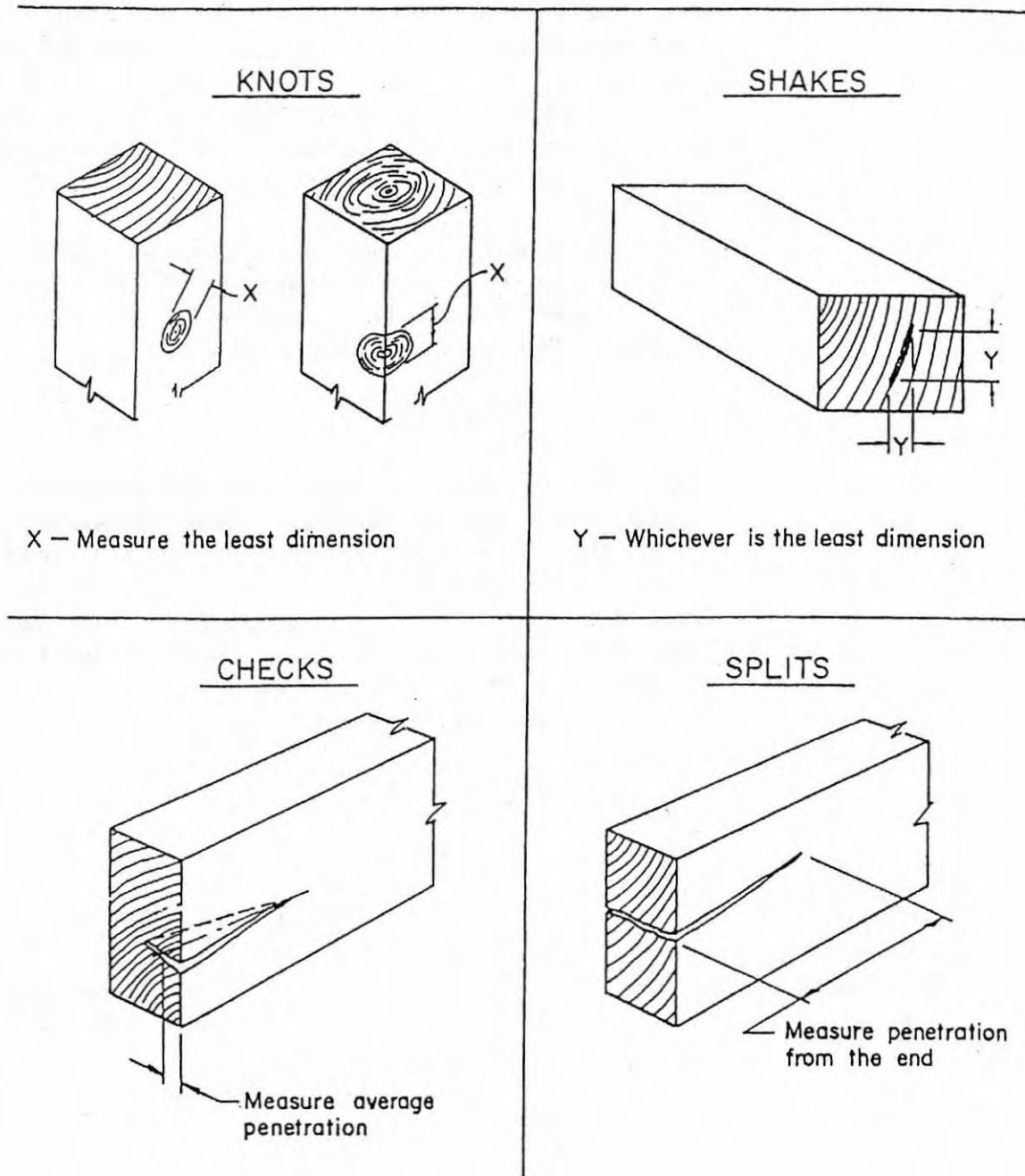


Figure A

GUIDELINES FOR INSPECTION AND
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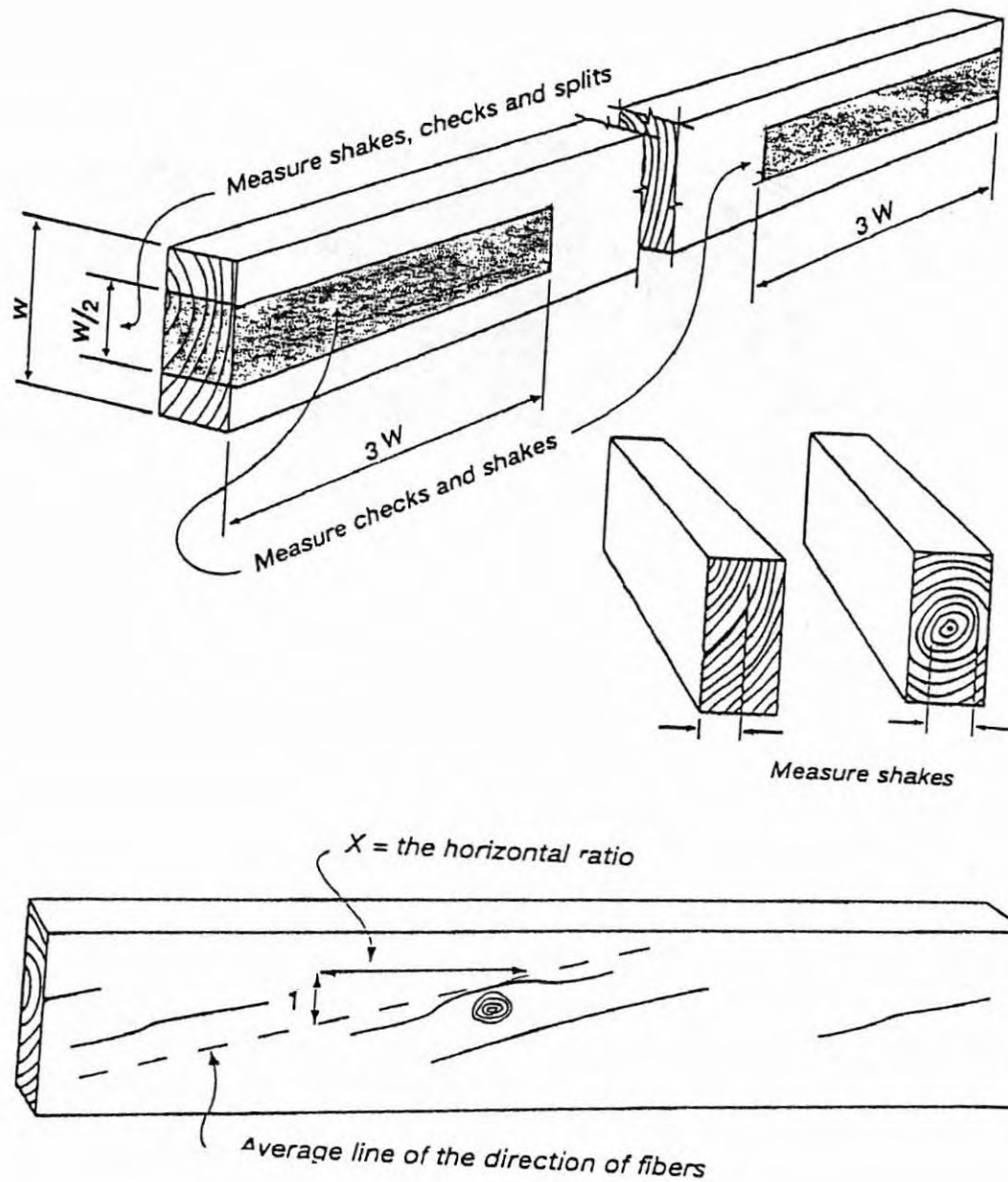


Figure B

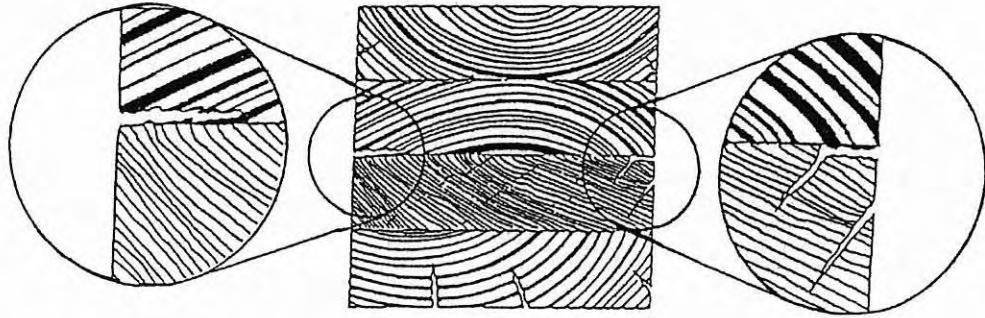
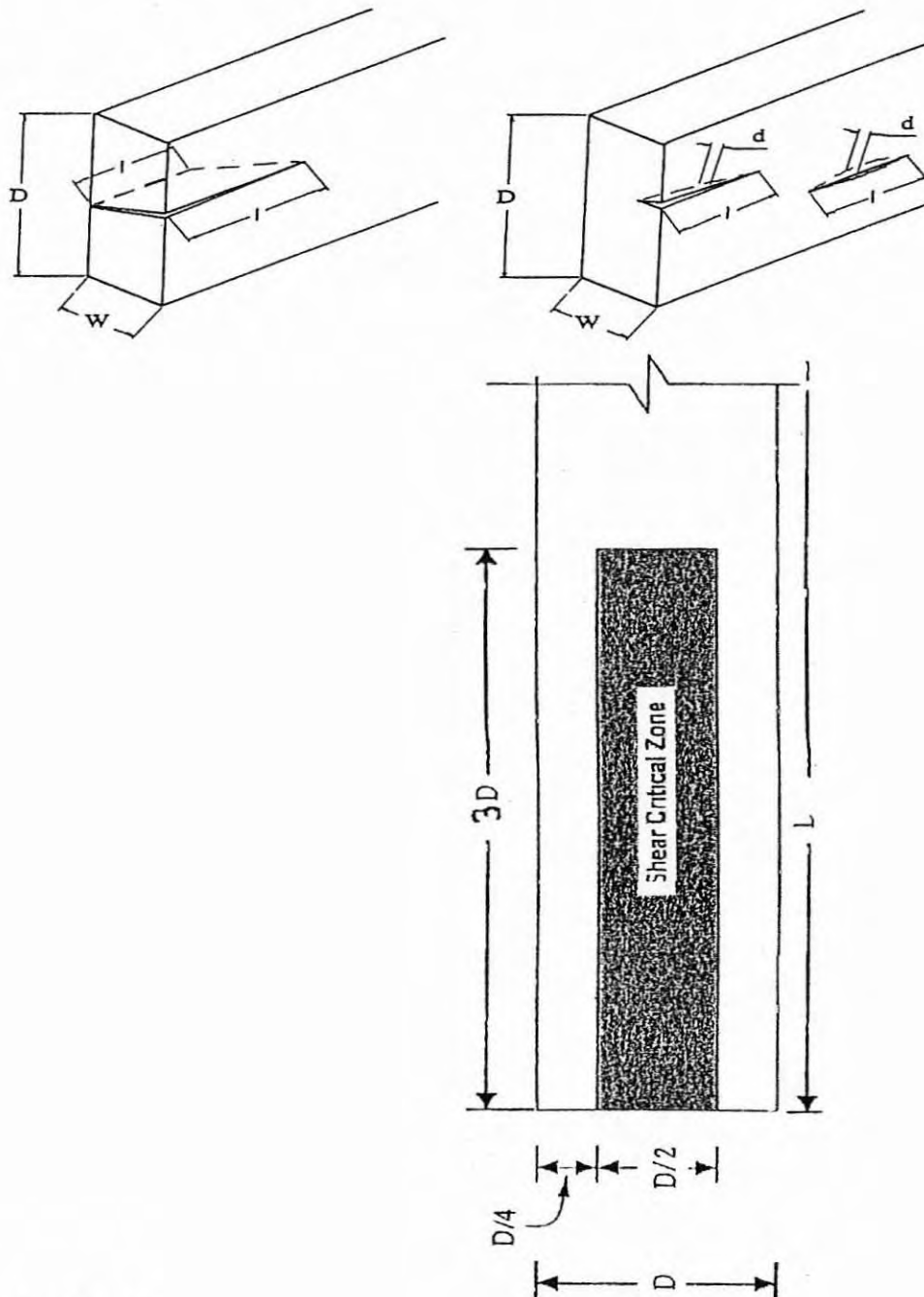


Figure C

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"d" allowable = $0.1 W$

"l" allowable = $0.9W$

L = length of the post above the surface

Figure D